

Urban Informatics

Marcus Foth

Urban Informatics Research Lab
Queensland U of Technology
Brisbane QLD 4059, Australia
m.foth@qut.edu.au

Jaz Hee-jeong Choi

Urban Informatics Research Lab
Queensland U of Technology
Brisbane QLD 4059, Australia
h.choi@qut.edu.au

Christine Satchell

Urban Informatics Research Lab
Queensland U of Technology
Brisbane QLD 4059, Australia
christine.satchell@qut.edu.au

ABSTRACT

The increasing ubiquity of digital technology, internet services and social media in our everyday lives allows for a seamless transitioning between the visible and the invisible infrastructure of cities: road systems, building complexes, information and communication technology, and people networks create a buzzing environment that is alive and exciting. Driven by curiosity, initiative and interdisciplinary exchange, the Urban Informatics Research Lab at Queensland University of Technology (QUT), Brisbane, Australia, is an emerging cluster of people interested in research and development at the intersection of people, place and technology with a focus on cities, locative media and mobile technology. This paper seeks to define, for the first time, what we mean by ‘urban informatics’ and outline its significance as a field of study today. It describes the relevant background and trends in each of the areas of people, place and technology, and highlights the relevance of urban informatics to the concerns and evolving challenges of CSCW. We then position our work in academia juxtaposed with related research concentrations and labels, followed by a discussion of disciplinary influences. The paper concludes with an exposé of the three current research themes of the lab around augmented urban spaces, urban narratives, and environmental sustainability in order to illustrate specific cases and methods, and to draw out distinctions that our affiliation with the Creative Industries Faculty affords.

Categories and Subject Descriptors

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

ACM Classification Keywords

Design, Experimentation, Human Factors, Theory.

Author Keywords

Urban informatics, urban computing, digital augmentation, environmental sustainability, ubiquitous computing, pervasive technology, digital cities, creative industries

INTRODUCTION

In 2001, the Creative Industries Faculty at Queensland University of Technology (QUT) in Brisbane, Australia,

was formed merging the Academy of Arts and the School of Media and Journalism. It now comprises study areas in acting, animation, creative writing, dance, drama, entertainment industries, fashion, film, TV & new media, interactive & visual design, journalism, media & communication, music & sound, technical production, and visual arts. Across the board, technology provides innovative opportunities for creative industries staff and students in the creation of artistic and research works, as new outlets for their creativity, and as a means of publishing, sharing and discussing findings and results. Social media and digital technology enable networked performances and new cultural experiences.

Founded in 2006, the Urban Informatics Research Lab is a dynamic and fast growing team working across research and development at the intersection of people, place and technology with a focus on cities, locative media and mobile technology. Our team is transdisciplinary in that it comprises and collaborates with architects with degrees in media studies, software engineers with expertise in urban sociology, human-computer interaction designers with a grounding in cultural studies, and urban planners with an interest in digital media and social networking. Being hosted by the Creative Industries Faculty, and specifically the cross-faculty research *Institute for Creative Industries and Innovation* at QUT enables our projects to embrace the creative energy of a range of disciplines across design, performance, production and writing.

Following on from the 2009 remarks about urban informatics in the Preface to [14], this paper attempts, for the first time, to describe and formulate a working definition of what currently guides the scale and scope of the Urban Informatics Research Lab’s activities. Drawing attention to the relevance of urban informatics in the context of CSCW, the following section describes some of the key background trends in each of the areas of people, place and technology that we coalesce and take advantage of in the lab’s work. Drawing out similarities and differences, the next section reviews related research concentrations and labels in order to position our work in academia and distinguish it from pervasive / ubiquitous / urban computing. This is followed by a discussion of the history and disciplinary influences as they pertain to urban informatics. Offering an illustration of cases and methods, the last section of the paper provides an exposé of the three current research themes of the lab around augmented urban spaces, urban narratives, and environmental sustainability. However, it is beyond the scope

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and intent of this paper to report on specific findings of any of the individual research projects of the lab which are being reported in other research publications. Our goal here is to define urban informatics.

BACKGROUND AND TRENDS

Urban informatics as a disciplinary domain is situated at the intersection of notions, trends and considerations for *place*, *technology*, and *people* in urban environments. These are now discussed in turn. We will then examine the way in which these themes bring about a construction of urban informatics that has relevance for the evolving challenges of CSCW.

Place

Simmel's observation of the rising metropolitan life in Europe at the beginning of the 20th century was that "[t]he relationships and affairs of the typical metropolitan are usually so varied and complex that without the strictest punctuality in promises and services the whole structure would break down into an inextricable chaos" [46]. In recent years, there has been an epochal shift in urban densification across the globe. More than half of the entire global population is now living in cities. The UN Population Fund [50] predicts that the urban population will grow even further to reach 60% of the entire global population by 2030. Thus planning, developing, and experiencing various infrastructures of the city, including social and technological, are becoming increasingly complex. As argued in [14], such complexity necessitates a *real-time* examination with flexibility in macro-/microscopic perspectives to deal with both tangible and intangible constituents of the city as a 'hybrid space' [12] between the physical and digital. Urban informatics as a scholarly domain offers useful research apparatuses for this type of examination.

Townsend [49] argues that, "*the timing is certainly right. Urban planning is well into an undeclared crisis of thought leadership – despite it being one of the best avenues for dealing with global challenges like climate change and migration. Information science is poking its head out of the burrow and seeing the enormous intellectual challenge of expanding what worked on the desktop of the elites, to a diverse and mobile urban population.*" Townsend refers to two trends: First, decision making support for the variety of situations and the diversity of people in cities requires the information sciences to deliver complex modelling and simulation tools for urban planners which they can use to represent the many aspects of the behaviour of cities and their inhabitants, including transport, utilities, facilities, and the environment. It is hoped that such tools can assist with rational decision making about future developments and improve resource management whilst considering the diversity of urban contexts and environmental factors. However, secondly, such tools should not stay just in the hands and power of professionally trained urban planners. Similar to the way Web 2.0 tools and services have brought about a more participatory Internet experience, neogeography and

related innovation in the *place* domain need to ensure the products of the information sciences deliver access, usability and usefulness tailored to "*a diverse and mobile urban population*" rather than elite experts only.

Finally, it is important to consider that "The City" as a conceptual category and abstract intellectual notion is an intriguing but also dangerously complex entity to such an extent that its merits on this broad and encompassing level may not even be useful. Williams, Robles, and Dourish [52] unpacked the assumptions underpinning "The City" in a lot of urban informatics research and found a dense ecology of impersonal social interactions occurring within recognisably public places. They argue for a heightened awareness that accounts for local particularities between cities as well as the broader global networks of connection between these sites.

Technology

The advancement of network technologies – most notably the Internet – has offered ways to augment experiences of 'place' in two contradicting ways. While wireless ubiquitous computing allows for interactivity in a *place-independent* way across physical and geographical boundaries, technologies such as mobile and locative media provide access to *place-specific* information. Movements such as 'Earth Hour' are a clear example of social networking assisted by information and communication technologies (ICTs) that can connect individuals and communities around the world to make an impact based on their shared beliefs [1]. In the current hybrid environment, many of its constituents are becoming – if not already – the 'Internet of Things,' hinting at the potential of more inclusive interactions (also thus exclusion) amongst people and other entities that jointly constitute society. We explore four trends in technology innovation further:

First, everyday technology becomes more and more ubiquitous: small, embedded and accessible anywhere, anytime [23]. Bell and Dourish [3] argue that the design and development of **ubiquitous computing** (ubicom) as well as the ability to access information in places other than the conventional 'desktop,' call for a better appreciation of the 'messiness of everyday life,' which ultimately requires social and cultural research skills in addition to technical expertise. Dave [11] compiled examples of such cross-disciplinary studies in the field of urban ubicom, which our research tries to enrich further. The findings of both our own [4, 39, 40, 42] as well as other research [10, 22, 31, 36] corroborate our belief that the mobile phone will play a crucial role in expanding the means of participatory culture in an effort to embrace and foster values of sustainability.

Second, as a consequence of widespread ubicom deployment in urban environments such as sensor networks, locative media and mobile devices [43], the accessibility of **real-time information** enables a major transformation of the way we perceive, understand and subsequently con-

ceive and plan city spaces [7]. Heralding the ‘real-time city’, Townsend [49] writes, “*Where we will see lots of change is in the software that shapes cities. Embedded sensing will replace a lot of human watchers, and ‘watch’ things on a frequency and scale we can barely imagine. But what will be important is how these abundant data streams provide a new ability to model and simulate very complex urban systems in real-time. Whereas today, urban managers and planners react on the time cycle of a census, by mid-century real-time dashboards and predictive models will rule the trade. ... If aerial photography showed us the muscular and skeletal structure of the city, the revolution in urban informatics is likely to reveal its circulatory and nervous systems.*”

Third, our lab’s research goal to inform the design of real-time mobile information systems that make the invisible visible holds great potential to have wide-ranging impacts on sustainable urban development. By being mindful of these developments at the very outset of this research, as well as avoiding to pre-empt any conclusions (that urban informatics are good for environmental sustainability – are they really?), we are guided by a **balanced affinity considering social, economic and environmental downsides**. Ubicomp applications and devices require electricity, one of the main causes of greenhouse gas emissions; in Australia the combined domestic and workplace usage accounts for one fifth of total national emissions [9]. However, as noted in the Stern [47] report, removing ‘barriers to behavioural change’ [34] is one of the essential elements in advancing opportunities for energy efficiency. Our work in this area, bringing real-time environmental data into the homes and hands of the city dwellers via ubicomp, finds vast potential for positive feedback and learning to better understand the impacts of personal and collective habits.

Fourth, there is a trend towards Geographical Information Systems (GIS) and related tools that can be used by lay persons and non-experts without intensive training. This new trend of GIS has led to the term ‘Neogeography’ coined by Di-Ann Eisnor of Platial Inc., which describes a notion of a ‘geography without geographers’ [48]. If neogeography introduces tools and services that allow non-geographers to use advanced GIS, similarly, is there potential for the emergence of a **neo-planning paradigm** in which urban planning is carried out through active civic engagement aided by Web 2.0 and new media technologies thus redefining the role of practicing planners?

In the face of these trends, as well as the continued and accelerated crisis in environmental, economic and social sustainability, a number of trends informs our work in urban informatics and specifically the possible role of community engagement in contributing to enhancing urban sustainability:

- i. Changes in the public sphere in terms of participation, online deliberation systems, polity of urban futures;

- ii. The possible use of user-generated content for urban planning (paralleling the rise of user-generated content in other domains);
- iii. The related role of social networking, collective and civic intelligence, and crowd-sourcing in urban futures;
- iv. The rise of technologies such as wireless Internet and mobile applications, and the impact of neogeography, simulations and 3D virtual environments that reproduce and analyse complex social phenomena and city systems in urban futures, design and planning.

People

The urban environment is increasingly conceptualised as a complex techno-social network. The city, however, only meaningfully exists when it is occupied by a sustained stream of people. In this sense, people are the core of the city. From individuals to collective entities, people are increasingly presented with opportunities to make their voice heard on a variety of issues. The proliferation of blogs and social networking sites such as *Facebook* and *Twitter* proves that media produsage – referring to the convergence of production and usage as evidenced in the rise of user-led content creation [5] – is becoming part of everyday social interaction. Individuals concurrently exist as constitutive nodes and users of the city as a network. Hence concepts such as communicative ecology – which refers to the technological and social context in which communication processes occur [17, 26] – and network sociality [16] are pivotal to understanding urban processes today. Urban environments currently exist as communicative hubs whether it is in regards to convoluted copper cables or number of mobiles phones per capita and thus have greater potential to be the site for participatory culture that could bring about significant transformations in socio-cultural, economic, and political domains [29, 32]. As Shirky [45] observes, ‘here comes everybody’ – creating and leveraging collective intelligence via ICTs. As such, the main challenge to bring about significant changes in societies is to ensure equal access to technologies and associated literacy skills.

The means to engage in participatory culture are no longer limited to the technically versed or the civically inclined. Scholars such as Jenkins [28] and Burgess et al. [6] have identified socio-technical trends towards a wider, ‘vernacular,’ ability of people to participate in digital culture through personal expressions of creativity. The implications for citizenship, and especially cultural citizenship, only start to be realised now. Urban informatics makes contributions towards exploring the possibilities that can inform the tools, methods and practices of participation. Many examples of how participatory culture is enabled by recent technological innovation rely on so-called ‘Web 2.0’ applications and services such as blogs, *Wikipedia*, *YouTube*, *Flickr*, and social networking sites such as *Facebook*, which are arguably more open, collaborative, personalisable, and therefore participatory than the previous Internet experience. According to [30], the participatory

qualities of Web 2.0 encourage ordinary users to make their knowledge explicit and help a collective intelligence to develop. In an urban context, we argue that such capabilities present diverse possibilities for network socialities and the rise of a profound urban epistemology [16, 19]. New tools and practices, inspired by user-led innovation, are springing up faster than our ability to analyse them individually. Therefore, urban informatics does not focus on individual applications and sites but instead seeks to harness the underlying principles of participatory culture by building on Beer & Burrows' [2] proposed three broad areas of investigation:

- i. The changing relations between the production and consumption of Internet content;
- ii. The mainstreaming of private information posted to the public domain; and,
- iii. The emergence of a new rhetoric of 'democratisation.'

Urban Informatics and the Evolving CSCW Challenges

The above process of discussing urban informatics' three tenants – place, technology and people – draws attention to its relevance to disciplines with complimentary concerns such as CSCW. In the context of *Place*: Like urban informatics, CSCW research is actively reconceptualising notions of 'The City.' Harrison & Dourish [25] for example, are replacing implied notions of space with more specific understandings of explicit notions of place. Indeed, urban informatics, with its emphasis on 'place' shares a common interest with one of the biggest evolving challenges of CSCW. The challenge of accounting for the way in which interactions are transcending the boundaries of the user's fixed desktop PC by moving into the heavily digitized world of personal and urban computing. As argued by [8], place is integral for framing our understanding of interactions in increasingly complex environments that include technology, physical and material resources, and especially, other inhabitants.

Technology: Like urban informatics, CSCW perspectives highlight the way in which technology, through the process of digitizing the city, alters our perceptions, our expectations and our behaviours in urban spaces. For example, Palen & Sanusi, noting that a 'blanket' of wifi now covers our cities, set about to see how this might impact users in two every day urban settings – the coffee shop and the car park [38]. As commercially hosted wifi seeps beyond the physical boundaries of the premises, users drew on both space-based notions of ownership, and place-based notions of legitimacy to situate their own connectivity.

People: A reoccurring theme within urban informatics is the construction of city dwellers, not as segregated units who might cross paths for moments in time; but rather, as participating members of a greater collective, diverse culture. Urban informatics seeks to understand the process of participatory urbanism more deeply in order to contribute to an infrastructure that can better support connectedness with each other and with places. This approach is tightly

coupled with the very essence of CSCW which seeks to support the processes through which collaborative interactions are sustained. This is emphasized by Fitzpatrick [13] who explores the way that place is constituted in the ongoing relationship between people in spaces and the resources they use to meet their needs.

URBAN INFORMATICS

Definition

The working definition of what currently guides the scale and scope of the QUT Urban Informatics Research Lab's growth is as follows:

Urban informatics is the study, design, and practice of urban experiences across different urban contexts that are created by new opportunities of real-time, ubiquitous technology and the augmentation that mediates the physical and digital layers of people networks and urban infrastructures.

Urban informatics deals with the processing of information particularly via network technologies, which comprises a wide range of urban constituents from the overall configuration of the city (such as the control and monitoring of resources through sensor networks) to the individual's day-to-day interaction with technologies (such as the mobile phone and locative media use). While urban informatics shares similarities with pervasive / ubiquitous / urban computing, it is different from the others in its focusing on urban (and peri-urban) contexts as the site of technical enquiry as compared to focusing on non-urban (rural) environment or technology itself. Urban informatics takes a transdisciplinary approach to understanding the city as an ecology that consists of technological, social, and architectural layers.

Terminology

Within the last decade, the attention and interest in the area of urban informatics research and development has increased in parallel with the heightened urgency and immediacy of trends in the three aforementioned areas of influence across people, place, and technology in urban environments. Related research concentrations and labels are in use to signify a shared interest and common passion for producing excellence and impact along similar research and development trajectories. Both the 'people' (**urban sociology**) and the 'place' (**urban studies** and architecture) centred perspectives have a much longer tradition and history than the technology aspect that emerged relatively recently. In addition to the term 'urban informatics', one of the most prominent descriptors is '**urban computing**' that situates the focus of interest in a strong grounding in both ubicomp and human-computer interaction design and research. Four collections of works have been compiled that set the scene:

- 2006 'Urban Computing: Navigating Space and Context' special issue of *Computer*, 39(9);
- 2007 'Urban Computing' special issue of *Pervasive Computing*, 6(3);

- 2007 ‘Space, Sociality, and Pervasive Computing’ special issue of *Environment and Planning B*, 34(3);
- 2007 ‘Urban Informatics: Software, Cities and the New Cartographies of Knowing Capitalism’ special issue of *Information, Communication & Society*, 10(6).

With its sharp focus on technology, the term ‘urban computing’ falls short of adequately representing the triad of people, place, and technology that makes up urban informatics research, specifically the human element: people, citizens, urban residents, city dwellers, urbanites. ‘Informatics’ with its implied reference to information systems and information studies slightly shifts the attention – away from the hardware and more towards the softer aspects of information exchange, communication and interaction, social networks, and human knowledge.

Similar thinking probably guided Gurstein [24] who coined the term ‘community informatics’ (rather than for example, community technology) to underline the attention that scholars and practitioners in this field pay to the impact of using ICT on the socio-cultural and economic development of communities. Likewise, urban informatics research and development is concerned with the impact of technology, systems and infrastructure on *people* in urban environments. As such, urban informatics as a concept resonates with Mumford’s [35] use of the term ‘technics’ (as opposed to technologies), highlighting the active interplay between technological and social domains – or techno-social development – rather than a purely socially or technologically deterministic approach to understanding urbanisation processes and their impacts on society.

Urban informatics is a relatively new term. Rheingold [37] may have coined the term in his article *Cities, Swarms, Cell Phones: The Birth of Urban Informatics*, in which he uses the expression ‘urban informatician’ to refer to public wireless Internet advocate and researcher Anthony Townsend. More recently, there has been a resurgence of the use of the term ‘urban informatics’ in academic lexicon, starting with [14]. In the foreword, Townsend [49] offers two broad definitions of urban informatics by synthesising the two constitutive terms of ‘urban’ and ‘informatics’: “the collection, classification, storage, retrieval, and dissemination of recorded knowledge of, relating to, characteristic of, or constituting a city,” or “in a city.”

The assemblage of works and projects under the urban informatics banner does usually not discriminate against case studies focussing on sub-urban (referring to separate residential communities within commuting distance to a physical city centre) or peri-urban (referring to the area immediately surrounding urban settlements) contexts. However, in seeking cross-disciplinarity, an undifferentiated attention on the ‘urban’ may segregate rather than connect with regards to non-urban areas such as rural and remote locations. In order to move the research agenda forward, urban informatics needs to embrace a view that

critically analyses the specificities of cities across the world and their residents, as well as their contextual embeddedness. Such sensitivity may establish a heightened awareness of the assumptions behind urban informatics [52].

Urban residents need to be appreciated as differentiated individuals that are situated in a variety of time and place settings attached to a historical context of personal experiences. Social networks form between these residents and commuters and visitors that move in and out of cities. These connections nurture symbiotic relationships and exchanges between urban, rural and remote areas. These notions require further work to challenge and debate the ‘urban’ focus with a view to ask, how this research contributes to address issues and opportunities *beyond the urban*. Collectively, we are required to lead a debate that unpacks ‘The City’ in order to appreciate its role in a broader and global context, as a node in a network of flows, as a centre of a region, or as a capital of a nation-state. In leading into this discussion, we assume that the realm of urban informatics comprises not just the physical city. Rather, these inquiries touch upon other conceptual compounds that spill over beyond the urban in a number of complex ways.

Disciplinarity

The process of creating a new disciplinary grouping – be it consciously, unconsciously, purposefully or serendipitously – brings about exciting new opportunities to build activity and engagement around a critical mass of people who share a common interest, understanding and approach towards a research topic. However, the shared commonality of a disciplinary grouping also brings with it a certain risk and danger that – despite old silos being merged, linked, or broken down – a new silo emerges. Our lab is *multidisciplinary* in that it collaborates with research colleagues from three main faculties at QUT, Creative Industries, Science & Technology, and Built Environment & Engineering, as well as with other relevant research entities across the world. Additionally, the lab tries to dissolve the rigid boundaries between disciplinary silos. ‘Nomadic’ researchers enter the stage who enjoyed more than one higher education and traverse seamlessly between academic schools. The lab can thus also be described as *transdisciplinary*, which Rheingold, cited in [27], describes as going, “*beyond bringing together researchers from different disciplines to work in multidisciplinary teams. It means educating researchers who can speak languages of multiple disciplines – biologists who have an understanding of mathematics, mathematicians who understand biology*” [27]. This citation represents the nature of the collaboration in our lab.

Building on QUT’s leadership in creative industries, new media and sustainable living in Australia, the *Institute for Creative Industries and Innovation* (iCi) is one of the most dynamic, fastest growing, and best resourced research centres available for this work. A six-faculty research institute, iCi places the multi-faceted research of the kind undertaken by the Urban Informatics Research Lab, at the core of the

university's strategic commitments. iCi is also supported by and collaborates with the Faculty of Built Environment and Engineering and the Faculty of Science and Technology. Both bring valuable expertise in social media, computer science, and sustainability to the team. Being hosted and supported by iCi, strengthens this major element in its research agenda, and enables the Urban Informatics Research Lab to embrace the creative energy of a range of disciplines across design, performance, production and writing.

CASES AND METHODS

In order to illustrate what this means in practice, the three research themes that the lab is currently working on are now described in turn. However, it is not our intent to report on specific findings of any project. Profiles and publications can be accessed at www.urbaninformatics.net.

Augmented Urban Spaces

Developers and governments around the world are still struggling to achieve socially sustainable neighbourhood communities in master-planned urban developments. Research into the network characteristics of community in the Kelvin Grove Urban Village, Brisbane, informs the design of proof of concepts of viable new media and ICT applications: peer-to-peer publishing tools, social networking systems, and locative mobile media. The new applications are trialled, and the impact of their use on enhancing the quality of community life in the Urban Village is being assessed. This research theme hopes to deliver transferable technologies and knowledge to strengthen our social fabric.

This program develops a better understanding of how urban neighbourhood communities can be assisted to grow in healthy ways by the use of social media. By careful attention to cultural and social assets in the community, innovation is engendered which enhance economic and social development. This leads to greater social inclusion, fair access to and smart use of information and services, urban sustainability and healthier local economies. Understanding the opportunities afforded by digital augmentation of social networks helps us negotiate the complex web of daily choices, access a greater social safety net and participate in the socio-cultural and socio-economic life of our cities.

The main project in this theme is entitled, "*Swarms in Urban Villages: New Media Design to Augment Social Networks of Residents in Inner-City Developments*." It is predominantly guided by a user-centred design approach informed by critical theory and cultural studies. Key publication outcomes to date: [4, 16, 41, 44]. Research student projects under this research theme include:

- *Augmented Urban Spaces: ICT to Bridge the Physical and Digital City* (Ronald Schroeter)
- *Understanding the Implications of Networked Social Interactions for the Design of Public Urban Spaces* (Kerrallie Houghton)
- *Creative Expression with New Media in Civic Spaces to Promote Active Citizenship* (Jodie Reynolds)

- *Designing Mobile Interaction for Serendipitous Encounters and Direct Social Navigation in the Hybrid Space* (Mark Bilandzic)
- *Enhancing the Experience of People in Urban Public Places through Context-Aware Mobile Content and Services* (Jan Seeburger)

Urban Narratives

Narrative based new media innovations, such as digital stories, computer gaming, and location based scenarios can enrich community engagement in the urban planning process. Community derived stories of the past and future can thereby inform policy and modelling to preserve heritage and yield more sustainable cities. This theme is the focus of a research team comprising creatives, new media specialists, educators, and urban planners who research, develop and evaluate a suite of creative outputs and allied planning prototypes in two urban locations: Brisbane and Sunshine Coast. Comparative analysis provide insights into different regional dynamics and assist with the transfer of outcomes to other communities.

This project supports new media creativity and literacy. It helps people participate in the urban planning process. It assists in improving a sense of belonging and fosters human talent and socio-cultural values favourable to creativity and innovation. By empowering people to bring about change within their local community, the project reinvigorates a more contemporary interpretation of community values in a knowledge society.

The main project in this theme is entitled, "*Remembering the Past, Imagining the Future: Embedding Narrative and New Media in Urban Planning*." It is guided by an experimental approach towards public history, youth studies, and social media. Key publication outcomes to date: [15, 18, 33, 51]. Research student projects under this research theme include:

- *The Heritage and History of Gasworks* (Ariella Van Luyn)
- *The Construction of Inner City Community Through Consumption* (Michelle Hall)
- *School-Community Engagement: A Critical Approach to Involving Young People* (Ruth Greenaway)
- *Knowledge-based Precincts in Regional Towns* (Joan K. Imukuka)

Environmental Sustainability

The Environmental Sustainability theme currently comprises two main projects, the first on energy monitoring, and the second on food cultures. The first project, "*Ubiquitous Computing to Bring Real-time Environmental Data into the Homes and Hands of Queensland Residents*," argues that Australia requires decisive action on climate change and issues of sustainability. This study explores ways to support people in making more sustainable consumer and lifestyle choices. User-centred design research informs the development of real-time, mobile, locational, networked infor-

mation interfaces, feedback mechanisms and persuasive and motivational approaches that assist in-situ decision making and environmental awareness in everyday settings. The study develops prototypes offering individual and collective visualisations of ecological impact and opportunities for engagement and collaboration in order to foster a participatory and sustainable culture of life.

Raising people's awareness with environmental data and educational information does not necessarily trigger sufficient motivation to change their habits towards a more environmentally friendly and sustainable lifestyle. This study seeks to develop a better understanding how to go beyond just informing and into motivating and encouraging action and change. Drawing on participatory culture, ubiquitous computing, and real-time information, the study seeks to deliver research findings that inform viable new design approaches and information interfaces which will contribute to the sustainability of a low-carbon future.

The second project is entitled, "*Eat, Cook, Grow: Ubiquitous Technology for Sustainable Food Culture in the City.*" Healthy and sustainable food is gaining more attention from consumers and industry. Yet many approaches to date are limited to information dissemination, advertisement or education. This collaboration between QUT, the University of Lincoln (UK), Queensland Health and local partners explores urban food practices – growing, cooking, eating – to support the well-being of people and the environment. User-centred design research informs the development of entertaining, real-time, mobile and networked applications, engaging playful feedback to build motivation. The study employs individual and group strategies to foster a food culture that employs new ways to produce, share and enjoy food that is green, healthy and fun.

Key publication outcomes in this research theme to date: [20, 21]. Research student projects under this research theme include:

- *Connecting People to their Resource Consumption through Real-time Data Visualisation* (Richard Medland)
- *Having the Cake and Eating it too: Opportunities of Social Media and Ubiquitous Computing to Reduce Food Wastage* (Jeremy Farr-Wharton)
- *Communicative Ecologies of Urban Agriculture: Opportunities for Social Media and Ubiquitous Computing* (Peter Lyle)

CONCLUSION

The triad of the Urban Informatics paradigm – people, place, and technology, has proven to be a simple but powerful way to conceptualise the thinking that guides the research and development work in the lab. Significant trends such as the rise of a participatory culture, social networking applications, Web 2.0 services, the increasing ubiquity of mobile technology and real-time sensor networks, and neo-geography, amongst others, have contributed to the timeli-

ness of this research work that is grounded in a variety of real-world contexts and applications.

This paper was written in the hope that sharing the underlying thinking and assumptions as well as hopes and aspirations of the Urban Informatics Research Lab in this public forum will enable a level of constructive scrutiny that contributes to pushing the agenda forward. Although a variety of disciplinary influences are essential to bring about innovation in this area, we believe that the net scale is still too small to survive on its own without reaching out to build new collaborative partnerships nationally and internationally. In this sense, this paper is also an invitation to join this growing community.

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